Electronics Engineering in VLSI Design & Technology

Preamble: The curriculum of B. Tech. (Electronics Engineering in VLSI Design & Technology) program offered by the Department of Electronics and Communications Engineering under Academic Regulation 2023 is prepared in accordance with the curriculum framework of AICTE, UGC and Andhra Pradesh State Council of Higher Education (APSCHE). Further this Outcome Based Curriculum (OBC) is designed with Choice Based Credit System (CBCS) enabling the learners to gain professional competency with multi-disciplinary approach catering the minimum requirement (Program Specific Criteria) of Lead Societies like Institute of Electrical and electronics Engineering (IEEE) as per the Engineering Accreditation Commission (EAC) of ABET and NBA. In addition, the curriculum and syllabi are designed in a structured approach by deploying Feedback Mechanism on Curriculum from various stakeholders viz. Industry, Potential Employers, Alumni, Academia, Professional Bodies, Research Organizations and Parents to capture their voice of the respective stake holders.

The Curriculum design, delivery, and assessment, the three major pillars of academic system is completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the learning outcomes facilitating the learners to achieve their Professional and Career Accomplishments. As the institution is registered under ABC, the students have the academic flexibility as per ABC in earning the total credits for the award of B. Tech. degree in Regular, Honors and Minor with specialization.

The Vision

To become recognized forerunner in Electronics and Communication Engineering by producing competent and responsible graduates.

The Mission

- To prepare technically competent graduates by establishing a conducive learner centric academic environment that uses innovative teaching learning processes
- To create research interests in the graduates by bringing in real time engineering challenges through industry collaborations
- To make the graduates socially responsible citizens who provide sustainable solutions maintaining ethical and professional standards

Program Educational Objectives (PEOs)

The PEOs are the educational goals that reflect Professional and Career Accomplishments that a graduate should attain after 4 – 5 years of his/her graduation.

The graduates of Electronics and Communication Engineering of NSRIT will

1. Continue to demonstrate the application of domain knowledge in solving real time problems and provide research based sustainable solutions in different specializations of Electronics and Communication Engineering or allied branch of engineering and technology and lead a satisfactory job employment with 21st century skills
2. Continue to involve themselves in life-long learning by enriching his/her competency in the chosen field of interest through professional experience, advanced studies, learning new age skills that demands dynamism for a continued better prospect to accomplish their professional and career goals
3. Continue to demonstrate the skill sets that are very much essential to work successfully for a rewarding career in an interdisciplinary environment

Program Specific Outcomes (PSOs)

1. To demonstrate the ability to design and develop complex systems in the areas of next generation Communication Systems, IoT based Embedded Systems, Advanced Signal and Image Processing, latest Semiconductor technologies, RF and Power Systems

2. To demonstrate the ability to solve complex Electronics and Communication Engineering problems using latest hardware and software tools along with analytical skills to contribute to useful, frugal and eco-friendly solutions.

Category-wise Credit Distribution of Courses

Category		AICTE	JNTU - GV	NSRIT(A)
HS	Humanities and Social Sciences	8 - 9%	8%	3.125%
BS	Basic Sciences	12 - 16%	13%	15.6%
ES	Engineering Sciences	10 - 18%	14%	10.3%
PC	Professional Core	30 - 36%	34%	38.4%
PE	Professional Elective	19 - 23%	21%	15.6%
MI	Inter- / Trans - Disciplinary Electives			
IN	Internship(s), Project & Seminars	8 - 11%	10%	10.3%
SC	Skill Oriented Courses	-	-	7.5%
MC	Mandatory Courses	-	-	-
AC	Audit Courses	-	-	-

Curriculum with Multiple Entry & Multiple Exit (ME-ME) adhering to NEP 2020
(Academic Regulation 2023)

Department of Electronics Engineering – VLSI Design and Technology

	Credit requirement	Exit credit requirement	Total credit	Level as per NCRF
Undergraduate Certificate| (After the one year of study)	40	10	50	L5
Diploma| (After two year of study)	80	10	90	L6
Advanced Diploma | (After two year of study) - Lateral Entrants	40	10	50	
B.Sc. in Engineering (After three years of study)	120	-	120	L7
B. Tech. (Regular) | (Four years of study)	160	-	160	L8
B. Tech. (Minor)	12 (Inclusive of 160)	-	160	L8
B. Tech. (Honors)	175	15 (160+15)	175	L8

Semester I								Category
No.	Code	Course Title	POs / PSOs	LD[1]	T[2]	P	Credit	
1	23HSX01	Communicative English	5, 8, 10	2	0	2	2.0	HS
2	23BSX23	Chemistry	1, 2, 7	3	1	0	3.0	BS
3	23BSX11	Linear Algebra & Calculus	1, 2	3	1	0	3.0	BS
4	23ESX01	Basic Electrical and Electronics Engineering	1, 2, 3	3	0	0	3.0	ES
5	23EC101	Network Analysis	1, 2, 3	3	0	0	3.0	PC
6	23HSX02	Communicative English Lab	9, 10	0	0	2	1.0	HS
7	23BSX24	Chemistry Lab	1, 4	0	0	2	1.0	BS
8	23ESX04	Electrical and Electronics Workshop	1, 2, 4	0	0	3	1.5	ES
9	23EC102	Network Analysis & Simulation Lab	1, 2, 4	0	0	3	1.5	PC
10	23SOC01	IT Workshop	1, 2, 3, 4, 5	0	0	2	1.0	SOC
11	23CSP01	NSS/ NCC/Scouts & Guides/Community Service	7, 8, 12	-	-	1	0.5	CSP
					Sub-total		20.5	
Semester II								Category
No.	Code	Course Title	POs / PSOs	LD[1]	T[2]	P	Credit	
1	23BSX31	Engineering Physics	1, 2, 7	3	1	0	3.0	BS
2	23BSX12	Differential Equations and Vector Calculus	1, 2, 5	3	1	0	3.0	BS
3	23ESX02	Introduction to Programming	1, 2, 3	3	0	0	3.0	ES
4	23ESX03	Basic Civil & Mechanical Engineering	1, PSO #1	3	0	0	3.0	ES
5	23BSX32	Engineering Physics Lab	1, 4	0	0	2	1.0	BS
6	23ESX06	Engineering Workshop	1	0	0	3	1.5	ES
7	23ESX07	Engineering Graphics	1, 10	2	0	2	3.0	ES
8	23ESX05	Computer Programming Lab	1, 2, 3, 4, 5	0	0	3	1.5	ES
9	23WLP01	Health, Wellness, Yoga & Sports	2, 7, 12	-	-	1	0.5	Wellness
					Sub-total		19.5	
Exit mandate at the level of I year for the award of Undergraduate Certificate[3]								
1		Certification #1		Min. 60 hours			2.0	SOC
2		Certification #2		Min. 60 hours			2.0	SOC
3		Job Specific Internship / OJT / Apprenticeship		Min. 60 Days			6.0	OJT

[1] In case of digital learning other than face-to-face learning, double the number of learning hours is mandate for the equivalent credit as per NCRF

[2] Suggested tutorials do not carry credits

[3] Students exiting at the level of first year of study must complete two skill-oriented courses that tunes to a total of 10 credits

Certification #1 & #2								
1	23SOC07	Plumbing	-	0	0	3	3.0	SOC
2	23SOC08	Air conditioning and refrigeration	-	0	0	3	3.0	SOC
3	23SOC09	Mobile troubleshooting	-	0	0	3	3.0	SOC
4	23SOC10	Computer assembling	-	0	0	3	3.0	SOC
5	23SOC11	Digital marketing	-	0	0	3	3.0	SOC
6	23SOC12	Lathe	-	0	0	3	3.0	SOC
7	23SOC13	Electrical winding	-	0	0	3	3.0	SOC
8	23SOC14	Masonry	-	0	0	3	3.0	SOC
9	23SOC16	Automobile servicing (Basics)	-	0	0	3	3.0	SOC

HS 23HSX01 Communicative English **2 0 0 2**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO 5	PO 8	PO 10	DoK
23HSX01.1	Make use of the setting, subject, and specific details from social or transactional discussions	1	1	3	L1 - L3
23HSX01.2	Identify grammatical frameworks to construct sentences and select the appropriate word forms	1	1	3	L1 - L3
23HSX01.3	Examine discourse markers to talk coherently about a subject in informal conversations	1	1	3	L1 - L3
23HSX01.4	Assessing the reader's or listener's overall comprehension of reading, listening, and summary materials	1	1	3	L1 – L6
23HSX01.5	Justify intelligible essays, resumes, and paragraphs	1	1	3	L1 – L6

All the Cos are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning.

Unit I: HUMAN VALUES: A Power of a Plate of Rice by Ifeoma Okoye **9 Hours**
"Tomorrow is waiting" by Holli Mintzer - Strange Horizons
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing one self and others
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information
Writing: Mechanics of Writing - Capitalization, Spellings, Punctuation – Parts of Sentences
Grammar: Parts of Speech, Basic Sentence Structures – forming question
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words
COs: CO1

Self Learning Topic: The Time Machine – H.G. Wells

Unit II: NATURE: Night of the Scorpion by Nissim Ezekiel (Indian & Contemporary) **9 Hours**
Patterns of a Murmuration, in billions of data points by Jy Yang - Clares World
The Brook by Alfred Tennyson (Poem)
Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together
Writing: Structure of a paragraph – Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions
Vocabulary: Homonyms, Homophones, Homographs
COs: CO2

Self Learning Topic: In Watermelon Sugar –Brautigan

Unit III: BIOGRAPHY: Elon Musk/Steve Jobs **9 Hours**

"The Life cycle of Software Objects" is a novella by American writer Ted Chiang, originally published in 2010 by Subterranean Press.
Listening: Listening for global comprehension and summarizing what is listened to
Speaking: Discussing specific topics in pairs orsmall groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension **COs: CO3**
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs-tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

Self Learning Topic: The Reader – Bernhard Schlink

Unit IV: Inspiration: TheToys of Peace by Saki **9 Hours**
A Story Told by a Machine The Circuitous Path to AI Writing
Listening: Making predictions while listening to conversations/transactional dialogues without video; listening with video
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/ relationships, communicate processesor display complicated data **COs: CO4**
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

Self Learning Topic: The Prime of Life – Simone De Beauvoir

Unit V: MOTIVATION: The Power of Intra personal Communication (An Essay) **9 Hours**
The interplay of AI, modern lives and literature by Mimi Mondal - Hindusthan Times
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension
Writing: Writing structured essays on specific topics **COs: CO5**
Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

Self Learning Topic: Do Androids Dream of electric ship? PhilipK.Dick The City and the Stars – Aarthur C. Clarke

Board of Studies	Basic Science & Humanities (English)
Approved in: BoS No. II	October 06, 2023
Approved in ACM: ACM No.VIII	October 21, 2023

Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
Workshop on Drama and enactive sessions	CO5	PO5, PO8, PO10
Seminar with Language expert	CO3	PO5, PO8, PO10

Text Books

1. Path finder: Communicative English for Undergraduate Students,1st Edition, Orient Black Swan, 2023 (Units 1, 2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

Reference Books

1. Dubey, ShamJi & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen, Academic writing: A Handbook for International Students Routledge, 2014
3. Murphy, Raymond, English Grammar in Use, 4th Edition, Cambridge University Press, 2019
4. Lewis, Norman, Word Power Made Easy – The Complete Handbook for Building a Superior Vocabulary, Anchor, 2014

Web References

Grammar

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

Vocabulary

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	15
L2	20	30
L3	10	30
L4	10	15
L5	05	05
L6	05	05
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List the major characters in the story
2. Who is the author of the poem "The Brook"?
3. What is the specific natural element that the poem revolves around?
4. Who is Elon Musk?
5. Can you name some of the companies founded or co-founded by Elon Musk?

L2: Understand

1. Can you summarize the plot of the story in your own words?
2. Explain the significance of the Brook's journey in the poem
3. What emotions or feelings does the poem evoke in you as a reader?
4. Explain the significance of SpaceX in Elon Musk's career and the aerospace industry
5. What are some of the major technological advancements associated with Elon Musk's companies?

L3: Apply

1. How would you apply the lessons from this story to your own life?
2. Can you apply the poem's themes to a different natural setting or body of water that you are familiar with?
3. Describe a real-life situation or natural phenomenon that parallels the Brook's journey in the poem
4. Apply Elon Musk's philosophy on sustainable energy to a current environmental issue
5. Describe a scenario in which the principles of innovation and risk-taking, as demonstrated by Elon Musk, could be applied in a different industry

L4: Analyze

1. How does the setting contribute to the overall mood of the story?
2. How does the poem's structure, including its rhyme scheme and meter, contribute to the overall meaning and mood of the poem?
3. Explore the role of sound and sensory imagery in conveying the Brook's essence
4. How has Elon Musk's leadership style contributed to the success of his companies?
5. Compare and contrast the goals and missions of SpaceX and Tesla, Inc.

L5: Evaluate

1. Evaluate the impact of the surprise ending in the story
2. Evaluate the effectiveness of the poem in conveying its themes and emotions
3. How might different readers interpret the poem's meaning based on their personal experiences or perspectives?
4. Do you agree with Elon Musk's vision for a sustainable future and his approach to achieving it? Why or why not?
5. Assess the ethical considerations surrounding some of Elon Musk's projects, such as Neuralink or the Hyperloop

L6: Create

1. Create a modern-day version of the story, updating the setting and circumstances while retaining the central theme of sacrifice
2. Write a short paragraph or poem that continues the story of the brook after the poem ends
3. Compose a piece of music inspired by the imagery and emotions conveyed in "The Brook"
4. Write a short essay discussing the potential long-term effects of Elon Musk's ventures on the global economy and society
5. Develop a concept for a new technology or project that aligns with Elon Musk's innovative spirit and goals

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Head of the Department
Dept. of Electronics & Communication Engg.
Nadimpalli Satyanarayana Raju Institute of Technology
Sontyam, Visakhapatnam - 3311

Chairman
Board of Studies (B.S & H)

BS 23BSX23 Chemistry

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO7	
23BSX23.1	Compare types of polymers and their applications in various technological fields	3	2	1	L1 - L3
23BSX23.2	Interpret the Nernst equation for electrode potential and classify various types of energy storage devices	3	2	1	L1 - L3
23BSX23.3	Compare the molecular orbital energy level diagram of different molecular species	3	2	1	L1 - L3
23BSX23.4	Apply the principle of Band diagrams in the application of conductors and semiconductors.	3	2	1	L1 - L3
23BSX23.5	Explain the principles of spectrometry, chromotography in separation of solid and liquid mixture	3	2	1	L1 - L3

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: Polymer Chemistry **9 Hours**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization with specific examples and mechanisms of polymer formation. Plastics –Thermo and Thermosetting plastics, preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6, 6, carbon fibres. Elastomers–Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – polyacetylene, polyaniline–mechanism of conduction and applications. Bio-Degradable polymers-Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA). **COs: CO1**

Self – Learning Topic: Advanced polymer methods

Unit II: Electrochemistry and Applications **9 Hours**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC) with examples. **COs: CO2**

Self – Learning Topic: Fundamentals and applications of electrochemistry

Unit III: Structure and Bonding Models **9 Hours**

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ2, applications to hydrogen,molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 andCO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order. **COs: CO3**

Self – Learning Topic: Shapes and significance of atomic orbitals

Unit IV: Modern Engineering materials **9 Hours**

Coordination compounds: Crystal field theory – salient features – splitting in octahedral and tetrahedral geometry. Properties of coordination compounds-Oxidation state, coordination, magnetic and colour. Semiconductor materials, super conductors- basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures. Supercapacitors: Introduction, Basic Concept-Classification – Applications. Nano chemistry: Introduction, classification of nanomaterials, properties and Quantum Dots, applications of Fullerenes, carbon nano tubes and Graphines nanoparticles. **COs: CO4**

Self – Learning Topic: Metal organic complexes

Unit V: Instrumental Methods of Chemical Analysis **9 Hours**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications

COs: CO5

Self – Learning Topic: The fundamental principles of instrumental measurements

Board of Studies		Basic Science & Humanities (Chemistry)	
Approved in: BoS No. II		October 06, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Principles and methodologies involved in the manufacturing of different eco-friendly polymers, FRP materials	CO1	PO1, PO2, PO7
2	Demonstration on principles and applications of Chemical energy sources	CO2, CO3	PO1, PO2, PO7

Textbooks

1. Jain and Jain, "Engineering Chemistry", 16th Edition, Dhanpatrai Publications, 2013
2. Peter Atkins, Julio de Paula and James Keeler, Atkins "Physical Chemistry", 10th Edition, Oxford University Press, 2010
3. Shikha Agarwal., "Engineering Chemistry: Fundamentals and Applications",13th Edition, 2012

Reference Books

1. Lee J. D., "Concise Inorganic Chemistry", 5th Edition, Oxford University Press, 2008
2. Skoog and West, "Principles of Instrumental Analysis", 6th Edition, Thomson, 2007

Web References

1. http://link.springer.com/chemistry
2. http://www.thphys.chemistry.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	50	50
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is a polymer?
2. How do polymers dissolve in solvents?
3. Define thermoplastic polymers and give two examples
4. What are single electrode potentials?
5. What is electromagnetic spectrum?

L2: Understand

1. Explain the free radical polymerization mechanism
2. Differentiate between addition polymerization and condensation polymerization
3. Explain the standard electrode potential by taking calomel electrode as an example
4. Demonstrate one or two applications of Zinc-air cell with chemical equations
5. Demonstrate the construction, working principle and one or two applications of electrochemical sensor with a neat schematic diagram

L3: Apply

1. Why would it be desirable to synthesize a polymer with a high degree of crystallinity? You are working for a company that produce a small appliances that use gears. Originally theyare using metal gears but have now decided to use plasic gears. Is the decision is acceptable? Justify it
2. Based on everyday experience, name one method of corrosion protection which you have observed in use?
3. Various studies on the annual cost of corrosion always conclude that corrosion amounts to 3-5% of nations gross national product, no matter in what year the study was under taken. Does this means that corrosion science and engineering are not making any headway. Justify with your answer
4. Describe one aspect of the operation of a semiconductor using principles from chemistry (Ex: Intrinsic, Extrinsic)

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Chairman
Board of Studies (BS & H)

BS 23BSX11 Linear Algebra and Calculus

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO2	DoK
23BSX11.1	Solve homogenous & non- homogenous linear system of equations	3	2	L1 – L4
23BSX11.2	Use Cayley- Hamilton theorem to find inverse & powers of a matrix and identify the nature of the quadratic forms using eigen values and eigen vectors	3	2	L1 – L4
23BSX11.3	Solve a given inequality using mean value theorems	3	2	L1 – L4
23BSX11.4	Make use of functions of several variables which is useful in optimization	3	2	L1 – L4
23BSX11.5	Analyze double and triple integrals using Beta and Gamma functions	3	3	L1 – L4

All the COs are mapped to PO12 as few self-learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Solving Homogeneous and Non-Homogeneous Systems of linear equations — 9 Hours

Rank of a matrix by echelon form, normal form. Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method

COs: CO1

Self – Learning Topic: Rank by using minors

Unit II: Eigen Values and Eigen Vectors, Cayley - Hamilton theorem and Quadratic forms — 9 Hours

Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

COs: CO2

Self – Learning Topic: Applications of Eigen Values and Eigen Vectors

Unit III: Calculus (Mean value theorems) — 9 Hours

Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems on the above theorems.

COs: CO3

Self – Learning Topic: Applications on the above theorems

Unit IV: Partial Differentiation and applications (Multi Variable Calculus) — 9 Hours

Partial Derivatives, Total derivatives, Chain Rule, Change of variables, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobians, maxima and minima of functions of two variables, method of lagrange multipliers.

COs: CO4

Self – Learning Topic: Jacobian of Implicit functions

Unit V: Beta and Gamma Functions & Multiple Integrals — 9 Hours

Gamma, Beta Functions and their Properties - Relation between Beta and Gamma Functions - Evaluation of Improper Integrals. Evaluation of Double triple Integrals - Direct Method

COs: CO5

Self – Learning Topic: Dirichlet's Integrals

Board of Studies	Basic Science & Humanities (Mathematics)	
Approved in: BoS No. VI	October 06, 2023	
Approved in: ACM No. VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 Introduction to MATLAB	CO1-CO5	PO2
Applications of Singular Value Decomposition	CO2	PO2

Text Books

1. Grewal, B. S. "Higher Engineering Mathematics", 44th Edition, 12th reprint, Khanna Publishers, 2022
2. Ramana, B. V. "Higher Engineering Mathematics",1st Edition, 35th Reprint,Tata McGraw Hill Education, 2019

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2021
2. Bali, N. P. "Engineering Mathematics",1st Edition, Lakshmi Publications, 2017
3. Peter O' Neil, "Advanced Engineering Mathematics",1st Edition, Cengage, 2010
4. Iyengar, T. K. V. Prasad, M. V. S. S. N., Ranganatham S. & B. Krishna Gandhi, "Engineering Mathematics – II", 3rd Edition, S. Chand Publications, 2020

Web References

1. http://nptel.ac.in/courses/
2. https://onlinecourses.nptel.ac.in
3. https://www.classcentral.com/course/swayam-basic-linear-algebra-13003
4. https://ocw.mit.edu/courses

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	15
L2	55	55
L3	20	20
L4	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. State Cayley-Hamilton theorem
2. State Euler's theorem
3. Define the rank of a matrix
4. What is an orthogonal transformation?
5. What is the necessary condition for a non-homogenous system AX=B to be consistent
6. What is the index of a quadratic form?
7. State Rolle's Theorem

L2: Understand

1. Check whether $x = r\cos\theta$ and $y = r\sin\theta$ are functionally dependent.
2. Check the consistency of the system $x+y+z=4$, $2x+3y-2z=3$, $x+7y-7z=5$
3. Find whether the homogenous system $x+y-3z+2w=0, 2x-y+2z-3w=0, 3x-2y+z-4w=0, -4x+y-3z+w=0$ possess a non-trivial solution

5. Verify Rolle's theorem for $f(x) = (x+2)^3(x-3)^4$ in [-2,3]

L3: Apply

1. Find non-singular matrices P and Q such that PAQ is in the normal form for $A=\begin{bmatrix} 2 & 3 & -1 \\ 0 & 1 & 2 \\ 3 & -4 & -2 \end{bmatrix}$
2. Reduce the matrix A to echelon form where $A = \begin{bmatrix} 1 & 2 & 4 & -3 \\ -2 & 7 & 5 & 2 \\ 4 & 13 & 0 & -4 \\ 6 & 5 & -3 & 3 \end{bmatrix}$
3. Find the shortest distance from origin to the surface $xyz^2 = 2$
4. Find the points on the surface $z^2 = xy + 1$ that are nearest to the origin

L4: Analyze

1. Consider the matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ -1 & 3 & 2 \\ 1 & -1 & 0 \end{bmatrix}$. If the characteristic polynomial of T is
   a. $C_T(\lambda) = (\lambda - 1)^p(\lambda - 1)^q$ then P =____ q =____
2. Find the minimal polynomial? what can be concluded from minimal polynomial?
3. Find a matrix S (if one exists) that diagonalizes [T]. What is the diagonal form of A of [T] produced
   i. by the matrix. **Answer:** $S = \begin{bmatrix} a & b & a \\ b & b & -c \\ -b & a & b \end{bmatrix}$ then a =____ b =____ c =_____
4. The matrices $A = \begin{bmatrix} a & 1 \\ -2 & d \end{bmatrix}$ and $B = \frac{1}{25}\begin{bmatrix} a & 1 \\ -2 & d \end{bmatrix}$ have same Eigen values then find the values
   a. of a and d
5. 5.Consider the matrix $A = \begin{bmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{bmatrix}$ for what ranges of values of a the matrix is positive definite?
6. Compare Rolles theorem with LMVT and identify which is the the generalized onest
7. Test whether the pair of functions $\frac{x+y}{1-xy}$ and $tan^{-1}x + tan^{-1}y$ are functionally dependent and if so find the relation between them?

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ES 23ESX01 Basics of Electrical and Electronics Engineering 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO2	PO3	PSO1	
23ESX01.1	Understand basic concepts of electrical circuits	3	2	-	1	L1, L2
23ESX01.2	Explain the operation of various machines and instruments	3	1	-	1	L1,L2
23ESX01.3	Understand the operation of different power plants	3	2	2	1	L1,L2
23ESX01.4	Analyze the working of electronic devices	3	-	-	1	L1 - L4
23ESX01.5	Examine the working of electronics circuits and devices	3	-	-	1	L1 - L4
23ESX01.6	Analyze various digital logic gates	3	2	2	1	L1 - L4

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: DC & AC Circuits **9 Hours**

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of Impedance, active power, reactive power and apparent power, concept and measurement of power factor (Simple numerical problems). **COs: CO1**

Self- Learning Topic: Applications of electrical circuits

Unit II: Machines and Measuring Instruments **9 Hours**

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge **COs: CO2**

Self - Learning Topic: Applications of electrical machines

Unit III: Energy Resources, Electricity Bill & Safety Measures **9 Hours**

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various power generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers. **COs: CO3**

Equipment Safety Measures: Working principle of fuse and miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, safety precautions to avoid shock.

Self - Learning Topic: Importance of electrical safety measures

Unit IV: Semiconductor Devices **9 Hours**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN junction Diode — Zener Effect — Zener Diode and its characteristics. Bipolar Junction Transistor — CB, CE, CC configurations and characteristics — Elementary – Treatment of Small Signal Amplifier. **COs: CO4**

Self - Learning Topic: Applications of Zener diode

Unit V: Basic Electronic Circuits and Instrumentation **9 Hours**

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator. Amplifiers: Block diagram of

Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing. Electronic Instrumentation: Block diagram of an electronic instrumentation system. **COs:CO5**

Self - Learning Topic: Applications of rectifiers and amplifiers

Unit VI: Digital Electronics **9 Hours**

Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs). Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters. **COs: CO6**

Self - Learning Topics: Application of logic gates

Board of Studies		Electrical and Electronics Engineering	
Approved in: BoS No. VI		October 07, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Operation of Brush-less DC motor and its applications to industry	CO 2	PO1, PO2, PO3, PSO1
2	Operation of servo motor and its applications to industry	CO 2	PO1, PO2, PO3, PSO1

Text Books

1. Kulshreshtha D. C., "Basic Electrical Engineering", Revised 1st Edition, McGraw Hill, 2021
2. Rajendra Prasad, "Fundamentals of Electrical Engineering", 3rd Edition, PHI Publishers, 2020
3. Kotari D. P. and Nagrath I. J., "Basic Electrical Engineering", 3rd Edition ,Tata McGraw Hill, 2020
4. Boylestad R. L., & Louis Nashlesky, "Electronic Devices & Circuit Theory", Pearson Education, 2021

Reference Books

1. Mehta V. K. & Rohit Mehta, "Principles of Electrical Machines", 4th Edition, S. Chand Publications, 2019
2. Sedha R. S., "A Text Book of Electronic Devices and Circuits", 3rd Edition, S. Chand & Co., 2014
3. Madhu Sahu K. B., "Basic Electrical Engineering", 4th Edition, Scitech Publications (India) Pvt. Ltd., 2019
4. Paynter R. T., "Introductory Electronic Devices & Circuits – Conventional Flow Version", 2nd Edition, Pearson Education, 2009

Web References

1. https://www.classcentral.com/course/swayam-electrical-machines-iitd-14030
2. https://onlinecourses.nptel.ac.in/noc20_ee60/preview
3. https://onlinecourses.swayam2.ac.in/nou22_ec03/preview

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	70	30
L3	-	30
L4	-	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

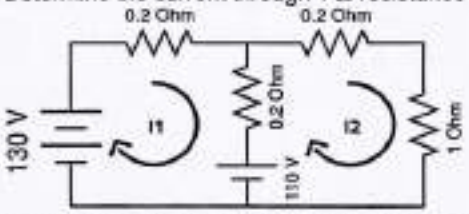
1. What is ohm's law?
2. Define RMS and peak values
3. What is form factor?
4. List any 2 types of rectifiers
5. List any 4 applications of operational amplifiers

L2: Understand

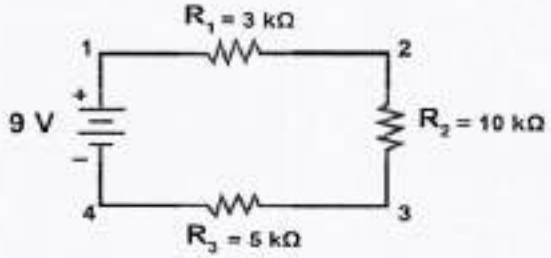
1. Explain in detail about Kirchhoff's current and voltage Law
2. Explain working principle of DC shunt generator
3. Explain the operation of single phase transformer

L3: Apply

1. Determine the current through 1 Ω resistance by using Kirchhoff's voltage law / Mesh analysis



2. By applying Kirchhoff's voltage law find current through R_3



L4: Analyze

1. Capacitors can be used for the filtering of ripples at the output of a rectifier. Suggest some other device which can work as a better filter
   a. Design the filter circuit
   b. Find the filter coefficients
   c. Analyse the form factor and ripple factor values of the rectifier by comparing them with the values of a rectifier which uses a capacitor for filtering
2. After completing the design and fabrication of an SSI-based digital system, a designer finds that one more inverter is required. However, the only spare gates in the system are a 2 input OR, a 3 input AND, and 2 input XNOR. How should the designer realize the inverter function without adding another IC?
3. For the manufacturing of a p-n junction diode we use either Germanium or Silicon semiconducting materials. Analyse the behaviour of a diode if it is made of a compound form of semiconducting materials like GaAs
   a. What change do you observe in the doping levels during the formation of p-region and n-region?
   b. What change do you observe in the V-I characteristics when compared with the characteristics of a conventional diode?

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PC 23EC201 Network Analysis 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO2	PO3	DoK
23EC201.1	Demonstrate concept of network reduction techniques and theorems	3	3	2	L1 - L3
23EC201.2	Illustrate steady state analysis of AC circuits	3	2	2	L1 - L3
23EC201.3	Explain the effect of transients on electrical circuits	3	2	1	L1 - L3
23EC201.4	Interpret the concept of coupled and magnetic circuits	3	2	1	L1 - L3
23EC201.5	Illustrate different parameters on two port networks	3	2	1	L1 - L3

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: Circuit Components and Theorems **9 Hours**

Types of circuit components, Types of sources and source transformations, mesh analysis and nodal analysis, problem solving with resistances only including dependent sources also. Principal of duality with examples.
Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also. **COs: CO1**

Self - Learning Topic: Series and Parallel R, L, C circuits

Unit II: Steady State Analysis of A.C Circuits **9 Hours**

Impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R, L, C, R-L, R-C, R-L-C, problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also. **COs: CO2**

Self - Learning Topic: Application of RC, RL circuits

Unit III: Transients **9 Hours**

First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to S plane rotation o roots **COs: CO3**
Laplace transform: Introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

Self - Learning Topic: Basic Homogeneous and Non Homogeneous equations

Unit IV: Resonance **9 Hours**

Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies. **COs:CO4**
Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

Self - Learning Topic: Series and parallel resonant circuit

Unit V: Two-port Networks **9 Hours**

Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, relationships between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also. **COs: CO5**
Image and iterative impedances, Image and iterative transfer constants. Insertion loss. Attenuators and pads.

Lattice network and its parameters.

Self - Learning Topic: Fundamentals of admittance and impedance

Board of Studies		Electrical and Electronics Engineering	
Approved in : BoS No. VI		October 07, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Affect of Ferranti effect on transmission lines	CO 5	PO1, PO2, PO3
2	Affect of resonance on networks	CO 4	PO1, PO2, PO3

Text Books

1. Sudhakar. A, Shyammohan S. Palli, "Circuits and Networks: Analysis and Synthesis", 5th Edition, Tata McGraw Hill, 2021
2. Hayt and Kimmarle, "Electric Circuit Analysis", 9th Edition, Tata McGraw Hill, 2020
3. Van Valkenburg M. E., "Network Analysis", 3rd Edition, Prentice Hall of India, 2021

Reference Books

1. David Irwin J., and Mark Nelms. R," Basic Engineering Circuit Analysis", 8th Edition, Wiley, India, 2021
2. John D Ryder, "Network Lines and Fields" 2nd Edition, Asia Publishing House, 2019

Web References

1. http://nptel.ac.in/courses/108/109/108/105/
2. https://onlinecourses.nptel.ac.in/102/105/106

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	30
L2	30	40
L3	50	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Differentiate between independent and dependent sources
2. State superposition theorem
3. State reciprocity theorem
4. List any two differences between RC and LC admittance functions

L2: Understand

1. Explain the Kirchhoff's current and voltage law
2. Explain the dot convention in coupled circuits
3. Explain parallel connection of 2 port networks
4. Explain co-efficient of coupling

L3: Apply

1. A coil having a resistance of 10 ohms and an inductance of 0.2 H is connected in series with a 100 μF capacitor are fed with 230 V, 50 Hz AC supply. Calculate (i) active and reactive components of current (ii) voltage across

the coil. Draw the phasor diagram

2. A constant inductance L is in parallel with a series R-C circuit in which R varies from zero to infinity. This combination is connected to a constant voltage, constant frequency supply. Show that the circuit takes a constant current from the source at all power factors between zero lagging and zero leading, if $X_c = X_L/2$. Draw the relevant locus diagram

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HS 23HSX02 Communicative English Lab

0 0 2 1

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO10	PO9
23HSX02.1	Recognize the various facets of English language ability, with a focus on LSRW abilities	3	1
23HSX02.2	Use numerous activities for language learners to practice communication skills	3	1
23HSX02.3	To improve listening and speaking comprehension, analyze the sounds, stress, rhythm, intonation, and syllable division of English speech	3	1
23HSX02.4	Assess your professionalism when taking part in group discussions and debating	3	1
23HSX02.5	Develop compelling messaging and get ready for upcoming interviews	3	1

List of Experiments

1. Vowels & Consonants — **COs: CO1,CO2**
2. Neutralization/Accent Rules — **COs: CO1,CO2**
3. Communication Skills & JAM — **COs: CO3,CO4**
4. Role Play or Conversational Practice — **COs: CO3,CO4**
5. E-mail Writing — **COs: CO4,CO5**
6. Resume Writing, Cover letter, SOP — **COs: CO4,CO5**
7. Group Discussions-methods & practice — **COs: CO4,CO5**
8. Debates- Methods & Practice — **COs: CO4,CO5**
9. PPT Presentations/ Poster Presentation — **COs: CO4,CO5**
10. Interviews Skills — **COs: CO4,CO5**

Reference Books

1. Meenakshi Raman, Sangeeta-Sharma, 4th Edition, Technical Communication, Oxford Press, 2022
2. Grant Taylor: English Conversation Practice, 1st Edition,Tata McGraw-Hill Education India, 2001
3. Hewing's, Martin, Cambridge Academic English (B2), Cambridge University Press, 2012
4. Balasubramanyam T., A Text Book of English Phonetics for Indian Students, 3rd Edition, Trinity, 2022

Suggested Software

- Walden Infotech
- Young India Films

Web Resources

Spoken English

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/AmelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent

12. https://www.youtube.com/user/letstalkaccent/videos
13. https://www.youtube.com/c/EngLanguageClub/featured
14. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
15. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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BS 23BSX24 Chemistry Lab

0 0 2 1

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	
		PO1	PO4
23BSX24.1	Determine the free ions in conductance of solutions	3	3
23BSX24.2	Analyze the various spectral of some organic compounds	3	3
23BSX24.3	Prepare advanced polymer materials	3	3
23BSX24.4	Measure the strength of an acid present in secondary batteries	3	3
23BSX24.5	Illustrate the functioning of the instruments such as Potentiometric meters	3	3

List of Experiments

1.	Estimation of Ferrous Iron by Dichrometry	**COs: CO1-CO3**
2.	Conductometrictitration of strong acid Vs. strong base	**COs: CO1,CO5**
3.	Conductometrictitration of weak acid Vs. strong base	**COs: CO1,CO5**
4.	Determination of copper (II) using standard hypo solution (Iodimetric titration)	**COs: CO1-CO3**
5.	Potentiometry - determination of redox potentials and emfs	**COs: CO1,CO5**
6.	Determination of Strength of an acid in Pb-Acid battery	**COs: CO1,CO4**
7.	Preparation of a Bakelite	**COs: CO3**
8.	Measurement of 10Dq by spectrophotometric method	**COs: CO2**
9.	Verify Lambert-Beer's law	**COs: CO2**
10.	Wavelength measurement of sample through UV-Visible Spectroscopy	**COs: CO2**
11.	Identification of simple organic compounds by IR	**COs: CO2**
12.	Preparation of nanomaterials by precipitation method	**COs: CO3**

References

1. Mendham J., Denney R. C., Barnes J. D., Thosmas M. and Siva Sankar B. Vogel's "Quantitative Chemical Analysis" 6th Edition, Pearson Publishers, 2000
2. Lab Manual for Chemistry, Department of Basic Science and Humanities, NSRIT, 2023

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ES 23ESX04 Electrical and Electronics Engineering Workshop 0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		
		PO1	PO2	PO4
23ESX04.1	Verify Kirchhoff's laws and theorems	3	2	3
23ESX04.2	Determine various parameters of electrical measuring instruments	3	2	3
23ESX04.3	Determine the basic characteristics of electrical machines	3	2	3
23ESX04.4	Illustrate the characteristics of various electron devices	3	2	3
23ESX04.5	Examine the operation of a logical circuit	3	2	3

List of Experiments

Part-A: Basic Electrical Engineering Lab

1. Verification of KCL and KVL — COs: CO1
2. Verification of superposition theorem — COs: CO1
3. Measurement of resistance using Wheat Stone bridge — COs: CO2
4. Magnetization characteristics of DC shunt generator — COs: CO3
5. Conduct brake test on DC shunt motor — COs: CO3
6. Speed control of DC shunt motor by field and armature control — COs: CO3
7. Perform Swinburne's test on DC machine — COs: CO3
8. Measurement of power and power factor using single - phase wattmeter — COs: CO2
9. Measurement of earth resistance using Megger — COs: CO2
10. Calculation of electrical energy for domestic premises — COs: CO2

Part-B: Basic Electronics Engineering Lab

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias — COs: CO4
2. Plot V-I characteristics of Zener diode and its application as voltage regulator — COs: CO4
3. Implementation of half wave and full wave rectifiers — COs: CO4
4. Plot input & output characteristics of BJT in CE and CB configurations — COs: CO4
5. Frequency response of CE amplifier — COs: CO4
6. Simulation of RC coupled amplifier with the design supplied — COs: CO5
7. Verification of truth table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs — COs: CO5
8. Verification of truth tables of S-R, J-K& D flip flops using respective ICs — COs: CO5

Web References

1. https://www.vlab.co.in/broad-area-electrical-engineering

References

1. Kulshreshtha D. C., "Basic Electrical Engineering", Revised 1st Edition, McGraw Hill, 2021
2. Sedha R. S., "A Text Book of Electronic Devices and Circuits", 3rd Edition, S. Chand & Co, 2014
3. Lab Manual for "Electrical and Electronics Engineering Workshop", Department of Electrical and Electronics Engineering & Department of Electronics and Communication Engineering, NSRIT

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PC	23EC202 Network Analysis and Simulation Lab	0	0	3	1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		
		PO1	PO2	PO4
23EC202.1	Verify Kirchhoff's laws and network theorems	3	2	3
23EC202.2	Calculate time constants of RL & RC for first and second order systems	3	2	3
23EC202.3	Illustrate frequency response of RL, RC networks	3	2	3
23EC202.4	Determine Q factor and bandwidth for resonant circuit	3	2	3
23EC202.5	Verify various two port network parameters	3	2	3

List of Experiments

1. Study of components of a circuit and Verification of KCL and KVL — **COs: CO1**
2. Verification of mesh and nodal analysis for AC circuits — **COs: CO1**
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits — **COs: CO1**
4. Verification of maximum power transfer theorem for AC circuits — **COs: CO1**
5. Verification of Tellegen's theorem for two networks of the same topology — **COs: CO1**
6. Study of DC transients in RL, RC and RLC circuits — **COs: CO2**
7. To study frequency response of various 1st order RL & RC networks — **COs: CO3**
8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses — **COs: CO2**
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit — **COs: CO4**
10. Determination of open circuit (Z) and short circuit (Y) parameters — **COs: CO5**
11. Determination of hybrid (H) and transmission (ABCD) parameters — **COs: CO5**
12. To measure two port parameters of a twin-T network and study its frequency response — **COs: CO5**

Web References

1. https://asnm-iitkgp.vlabs.ac.in/List%20of%20experiments.html
2. https://vlab.amrita.edu/?sub=1&brch=75

References

1. Sudhakar. A, Shyammohan S. Palli, "Circuits and Networks: Analysis and Synthesis", 5th Edition, Tata McGraw Hill, 2021
2. Hayt and Kimmarle, "Electric Circuit Analysis", 9th Edition, Tata McGraw Hill, 2020
3. Lab Manual for "Network Analysis", Department of Electrical and Electronics Engineering, NSRIT

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SOC 23SOC01 IT Workshop

0 0 2 1

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs / PSOs						
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
23SOC01.1	Perform Hardware troubleshooting	3	2	-	-	2	2	1
23SOC01.2	Explain the world wide web and Internet	3	2	2	-	2	2	2
23SOC01.3	Develop a working knowledge of HTML, CSS	2	2	-	-	3	2	2
23SOC01.4	Demonstrate the usage of MS-Word, MS-Excel spreadsheets	3	3	3	2	3	2	2
23SOC01.5	Show the use of MS-PowerPoint for presentations and experiment with ChatGPT AI tool	3	2	2	1	3	2	2

List of Experiments

PC Hardware **COs: CO1**

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web **COs: CO2**

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

HTML and Introduction to CSS **COs: CO3**

Task 1: Coding Basics: Introduction to HTML syntax, HTML, head, title, & body tags headings, paragraphs, & lists, strong & em tags, doctype, lang attribute, meta tag & Unicode character set

Task 2: Coding Links: Absolute & Relative URLs, Anchor tags & hrefs Linking to other websites, Linking to pages within a website Opening a link in a new browser window/tab

Task 3: Adding Images: Break tag, image tag & source attribute using the width, height, & alt attributes, using horizontal rules

Task 4: Introduction to Cascading Style Sheets (CSS): Style tag, tag selectors, font-size, font-family, color, & line-height properties, hexadecimal color codes

WORD **COs: CO4**

Task 1: Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 2: Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel **COs: CO4**

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP **COs: CO4**

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power point **COs: CO5**

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI Tools – ChatGPT **COs: CO5**

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model

completes them.
Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3.1: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Task 3.2: Futuristic Predictions: Have fun by asking the model to predict future technological advancements, societal changes, or even hypothetical scenarios. Compare its responses with your own ideas.
Ex: Prompt: "Predict how artificial intelligence will transform everyday life in the next 20 years."

References

1. Vikas Gupta, "Comdex Information Technology Course tool Kit", 6th Edition, Dreamtech Press, 2005
2. Cheryl A. Schmidt, "The Complete Computer Upgrade and Repair Book", 3rd Edition, Dreamtech Press, 2002
3. ITL ESL, "Introduction to Information Technology", 2nd Edition, Pearson, 2012
4. Kate J. Chase, "PC Hardware and A+ Handbook", Microsoft Press, 2004
5. Lab Manual for IT-Workshop, Department of Computer Science & Engineering, NSRIT

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Chairman
Board of Studies (CSE)

Head of the Department
Dept. of Electronics & Communicatin Engg.,
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam - 531173

CSP **23CSP01 NSS /NCC /Scouts & Guides /Community Service Project** **0 0 1 0.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		
		PO7	PO8	PO12
23CSP01.1	Understand the importance of discipline, character and service motto	3	1	1
23CSP01.2	Outline the needs and problems of the community	3	1	1
23CSP01.3	Solve some societal issues by applying acquired knowledge, facts, and techniques	3	2	1
23CSP01.4	Explore human relationships by analyzing social problems	2	1	1
23CSP01.5	Determine to extend their help for the fellow beings and downtrodden people	2	2	1

Unit I: Orientation **3 Hours**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc. **COs: CO1**
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

Unit II: Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition. **3 Hours**
iv) Organising Zero-waste day. **COs: CO2**
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.

Write a summary on any book related to environmental issues

Unit III: Community Service **3 Hours**

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc. **COs: CO3**
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs, etc.

General Guidelines

1. Institutes must assign slots in the Timetable for the activities
2. Institutes are required to provide instructor to mentor the students

Assessment Pattern

1. Evaluated for a total of 100 marks
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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Board of Studies (B S & H)

Head of the Department
Dept. of Electronics & Communication Engg.
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam - 531173

BS 23BSX31 Engineering Physics

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO2	PO7	DoK
23BSX31.1	Choose the experimental evidence of wave nature of light to understand interference in thin films, diffraction and polarization	3	2	1	L1 - L3
23BSX31.2	Apply the laws of physics, classify various types of lasers & optical fibers	3	2	1	L1 - L3
23BSX31.3	Interpret the concepts and applications of magnetic and dielectric materials	3	2	1	L1 - L3
23BSX31.4	Identify and summarize the crystal structures and XRD techniques	3	2	1	L1 - L3
23BSX31.5	Interpret the microscopic behaviour of matter with quantum mechanics, summarise various types of solids based on band theory and identify the type of semiconductor using Hall effect	3	2	1	L1 - L3

All the COs are mapped to PO12 as few self-learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Wave Optics — **9 Hours**

Interference: Introduction, Interference in thin films by reflection–Newton's rings (Theory, Experimental study), applications (wavelength of a source and refractive index of a liquid). Diffraction: Concept of diffraction difference between Fresnel's and Fraunhofer diffraction-Fraunhofer diffraction at single slit (quantitative), diffraction at double slit Diffraction grating. Raleigh's criteria, Resolving Power of grating. Polarization: Types of polarization, polarization by reflection, refraction and Double refraction–Nicol's prism construction and working Wave plates: half wave plate and quarter wave plate

COs: CO1

Self – Learning Topic: Young's double slit experiment

Unit II: Lasers and Fiber Optics — **9 Hours**

Laser: Concept of laser, Characteristics of laser, Spontaneous and Stimulated emission of radiation, Einstein's Coefficients, pumping mechanisms, Ruby laser, Helium Neon Laser-Applications of Laser (Communications, R&D, Medicinal, etc.)

Fiber Optics: Introduction to Optical fiber, Principle and structure of optical fiber, classification of optical fibers (based on modes and refractive index profile). Acceptance angle, Acceptance cone Numerical Aperture-Applications of optical fiber. (Communications, Medicinal etc.)

COs: CO2

Self – Learning Topic: Concepts of 3 level and 4 level LASER systems

Unit III: Magnetic Materials and Dielectric Materials — **9 Hours**

Introduction, magnetic dipole moment, Magnetic Susceptibility-Magnetic permeability–Classification of Magnetic materials–Dia, Para, Ferro, Weiss Domain theory(qualitative) Hysteresis curve, Soft and Hard magnetic materials–Applications. Dielectric Materials: Dielectric Polarization–Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic, Ionic and Orientational polarizations (qualitative), Lorentz internal field (qualitative), Claussius-Mossoti Equation-Applications of dielectrics

COs: CO3

Self – Learning Topic: Relation between D, E and P & Dielectric losses

Unit IV: Crystallography and X-Ray Diffraction **9 Hours**

Crystallography: Introduction, Space lattice, Basis, Unit cell, Bravais lattices–Crystal systems–structures and packing fractions of SC, BCC and FCC X-Ray Diffraction: Directions and planes in crystals–Miller indices–Separation between successive (h k l) planes–Bragg's law. Bragg's spectrometer, X-ray diffraction methods (powder and Laue) **COs: CO4**

Self – Learning Topic: Concept of Brillouin zones

Unit V: Quantum Mechanics and Semiconductor Physics **9 Hours**

Quantum Mechanics: Introduction De-Broglie's concept of Matter waves–Physical significance of wave function-Schrodinger Time Independent and time dependent wave equations–Particle in a one-dimensional potential box Semiconductor physics: Origin of energy band formation in solids, classification of materials into conductors, semiconductors and insulators using band diagram, Intrinsic and Extrinsic semiconductors. Hall Effect, Hall coefficient and applications of Hall Effect **COs: CO5**

Self – Learning Topic: Density of states - Fermi energy

Board of Studies		Basic Science & Humanities (Physics)	
Approved in: BoS No. II		October 06, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	LASER as a source in optical fiber communications	CO2	PO1, PO2, PO7
2	Merits and demerits of X-ray diffraction	CO4	PO1, PO2, PO7

Text Books

1. Avadhanulu M. N. & K Shirasagar P.G., "A Text Book of Engineering Physics", 1st Edition S. Chand Publications, 2011
2. Palanisamy P. K., "Engineering Physics", 4th Edition ,SciTech Publishers, 2014
3. Pillai S.O., "Applied Physics", 2nd Edition, New Age international Publishers, 2008

Reference Books

1. Charles Kittle, "Introduction to solid state physics", 5th Edition ,Willey India Pvt. Ltd., 2012
2. Arumugam M., "Applied Physics", 4th Edition , Anuradha Agencies, 2013
3. Bhattacharya D. K., "Engineering Physics", 2nd Edition , Oxford University Press, 2010
4. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", 1st Edition ,University Press, 2010
5. Pandey B. K. & Chaturvedi S., "Engineering Physics", 1st Edition, Cengage Learning, 2012
6. Srinivasan M. R., "Engineering Physics", 2nd Edition , New Age international Publishers, 2014

Web References

1. http://link.springer.com/physics
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com
5. https://nptel.ac.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	50	50
L3	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define interference
2. Define types of polarization
3. State Dielectric polarization and electric susceptibility
4. Define types of polarization in dielectrics
5. Define Spontaneous emission of radiation

L2: Understand

1. Explain the construction and working principle of Nicol's prism
2. Demonstrate working principle of He-Ne laser with energy level diagram
3. Outline de Broglie concept of matter waves
4. Discuss polarization by reflection
5. Explain the Raleigh's criteria

L3: Apply

1. Suggest a dielectric material with high dielectric constant, high operating voltage range and also which can be eco friendly for the preparation of a capacitor. Justify your answer
2. Suggest a soft magnetic material with low retentivity and coercivity, and also which can be eco friendly for the preparation of an electromagnet. Justify your answer
3. Even though based on quantum mechanical principles quantum free theory is a partly successful theory. Justify the statement

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BS 23BSX12 Differential Equations and Vector Calculus

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO2	PO5	DoK
23BSX12.1	Solve the first order differential equations related to various engineering fields	3	2	1	L1 - L4
23BSX12.2	Solve the second order differential equations related to various engineering fields	3	2	1	L1 - L4
23BSX12.3	Identify solution methods for partial differential equations that model physical processes	3	2	1	L1 - L4
23BSX12.4	Apply Gradient, Divergence, Curland Laplacian to scalar and vector point functions	3	2	1	L1 - L4
23BSX12.5	Interpret Gradient, Directional Derivative, Divergence, Curl and Green's, Stoke's and Gauss theorems	3	2	1	L1 - L4

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: Differential Equations of First Order and first degree **9 Hours**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits, Orthogonal trajectories

COs: CO1

Self – Learning Topic: Orthogonal trajectories

Unit II: Linear differential equations of higher order (Constant Coefficients) **9 Hours**

Linear differential equations, linear differential equations with constant coefficients, The operator D, the inverse operator $\frac{1}{D}$, $\frac{1}{D-a}$, $\frac{1}{D+a}$, Homogeneous & Non-Homogeneous Differential equations, Complimentary Function, Particular Integral, General solution, Wronskian, Method of Variation of parameters, Applications to L-C-R circuit problems

COs: CO2

Self – Learning Topic: Simple Harmonic motion

Unit III: Partial Differential equations **9 Hours**

Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

COs: CO3

Self – Learning Topic: Classification of second order partial differential equations

Unit IV: Vector Differentiation **9 Hours**

Scalar and vector point functions, vector operator del, del applied to scalar point functions - Gradient, del applied to vector point functions-Divergence and Curl, Laplacian operator, vector identities (without proofs).

COs: CO4

Self – Learning Topic: Geometrical meaning of all operators

Unit V: Vector Integration **9 Hours**

Line integral – circulation - work done, surface integral - flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

COs: CO5

Self – Learning Topic: Applications of the above theorems

Board of Studies		Basic Science & Humanities (Mathematics)	
Approved in: BoS No. VI		October 06, 2023	
Approved in: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Solving one-dimensional wave equation and two-dimensional equations using MATLAB	CO3	PO1, PO2, PO5
2	Applications of vector calculus in different branches of Engineering	CO4	PO1, PO2

Text Books

1. Grewal B. S., "Higher Engineering Mathematics", 44th Edition,12th Reprint, Khanna Publishers, 2022
2. Ramana B. V.,"Higher Engineering Mathematics",1st Edition, 35th Reprint, Tata McGraw Hill Education, 2019

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics",10th Edition, Wiley India, 2021
2. Bali N .P., "Engineering Mathematics",1st Edition, Lakshmi Publications, 2017
3. Peter O' Neil, "Advanced Engineering Mathematics",1st Edition, Cengage Publications, 2010
4. Iyengar T. K. V., Prasad M. V. S. S. N., Ranganatham S. and Krishna Gandhi B., "Engineering Mathematics - I", 2nd Revised Edition, S. Chand Publications, 2021
5. Iyengar T. K. V., Prasad M. V. S. S. N., Ranganatham S. and Krishna Gandhi B., "Engineering Mathematics - III", 8th Revised Edition, S. Chand Publications, 2020

Web References

1. http://nptel.ac.in/courses/
2. https://onlinecourses.nptel.ac.in
3. https://nptel.ac.in/courses/111/108/111108144/
4. https://ocw.mit.edu/courses

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	15
L2	55	55
L3	20	20
L4	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define a partial differential equation
2. What is a Bernoulli's equation?
3. What is the general form of Leibnitz's equation in y?
4. What is the sufficient condition for the exactness of Mdx+Ndy=0
5. Solve the PDE $z=px+qy-2\sqrt{pq}$
6. Solve$(D^2+2DD1+1)z=0$
7. Find the unit normal vector at (1,2,2) to the surface $\mathbf{x^2 + y^2 + z^2 = 9}$
8. Define a line integral and explain its significance in physics or engineering contexts
9. Define a homogeneous linear partial differential equation with constant coefficients

L2: Understand

1. Solve $(D^2-DD1+D1-1)z= \cos(x+2y)+e^{y-x}$
2. Find the directional derivative of the function $\emptyset = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface $x \log z - y2 + 4 = 0$ at (-1,2,1)
3. If $F=x^2yz$, $G= xy -3z^2$ Then find div(grad F x grad G)
4. Find the surface integral of $F = xy\bar{i} + z^2\bar{j} + 2yz\bar{k}$ over the tetrahedron bounded by x=0, y=0, z= 0 and the plane x+ y+ z =1
5. Solve $Dx + 2D'u = u$, $u(x,0) = 6e^{-3x}$ by the method of separation of variables
6. Solve $(1+y^2)\,dx +(x-e^{\tan^{-1}x})\,dy=0$
7. Solve $(D^2+3D+2)\,y = 4\cos 2x$
8. Explain the process of forming a partial differential equation by eliminating arbitrary constants and arbitrary functions from a given expression
9. Explain how the Wronskian is used to determine linear in dependence of solutions
10. Explain the geometric interpretation of the dot product and cross product of two vectors. How are these operators used in vector calculus

L3: Apply

1. Find the area of the circle $x^2+ y^2 =a^2$ using double integral in polar coordinates
2. Find the volume of the sphere $x^2 +y^2+z^2=a^2$ using spherical coordinates
3. Find by double integration the area lying between the parabolas $y^2=4ax$ and $x^2=4ay$
4. Find the scalar potential of the vector $F= (x^2-yz)\,i + (y^2-zx)\,j + (z^2-xy)k$, if exists
5. Evaluate by Gauss divergence theorem $F=(x^3-yz)i-2x^2yj-zk$ taken over the surface of the cube formed by the planes $x=y=z=a$
6. Analyze the implications of having complex roots in the characteristic equation of a second order differential equation
7. Given the PDE $u_x + 2u_x =0$, solve it using Lagrange's method to find the general solution

L4: Analyze

1. If $f(x, y, z) = 4x^2+7xy +3xz^2$, what is the direction in which the function f(x, y, z) increases more rapidly at the point P=(1.0.2)
2. List some physical examples of scalar and vector fields
3. From Stoke's theorem, analyze the form of Green's function for a curve lying in
   i. xy - plane ii. zx - plane
4. Asses the circulation of the field $F = y\bar{i} + (x+2y)\,\bar{j}$ around the closed path $x^2 +y^2=4$ where circulation in counter clockwise direction
5. Evaluate $\int (x + \sqrt{y})\,dS$ along a curve C, where c is given by $C = C_1 + C_2$ such that $C_1 = \{x = t, y = t2\}$ from (0,0) to (1,1) and $C_2 = \{x = t, y = t\}$ from (1,1) to (0,0)

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ES 23ESX02 Introduction to Programming

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs / PSOs					DoK
		PO1	PO2	PO3	PSO1	PSO2	
23ESX02.1	Illustrate basics of computers, problem solving approach and algorithmic thinking	3	3	2	3	2	L1, L2
23ESX02.2	Demonstrate the control structures, branching and looping statements	3	3	3	3	2	L1 – L3
23ESX02.3	Make use of arrays, pointers and string fundamentals	3	3	3	3	2	L1 – L3
23ESX02.4	Develop Modular program aspects in solving complex problems	3	3	3	3	2	L1 – L3
23ESX02.5	Identify the use of userdefined data types and files	3	3	3	3	2	L1 – L3

All the COs are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction to Programming and Problem Solving — **9 Hours**

Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem. Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

COs : CO1

Self - Learning Topics: Compilation and Interpretation

Unit II: Basics of C Programming — **9 Hours**

Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion. Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else-if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

COs: CO2

Self - Learning Topic: Escape Sequence

Unit III: Arrays, Pointers and Strings — **9 Hours**

Introduction, Operations on Arrays, Two Dimensional Arrays, Multidimensional Arrays. Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer. Strings: String Fundamentals, String handling functions.

COs: CO3

Self - Learning Topic: String pattern matching

Unit IV: Functions — **9 Hours**

Introduction to Function: Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Arrays as Function Arguments, Pointers as Function Arguments, Command Line Arguments, Variable Storage Classes. Recursion.

COs: CO4

Self - Learning Topic: Implementation of recursion

Unit V: User Defined Data types, File Handling — **9 Hours**

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type — Enum variables, Using Typedef keyword, Bit Fields. Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

COs: CO5

Self - Learning Topics: Binary files and operations on binary files

Board of Studies		Computer Science and Engineering	
Approved in: BoS No. VI		October 06, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs / PSOs**
1	Logic building using C Programming	CO1 – CO6	PO1, PO2, PO3, PO12, PSO1, PSO2
2	Real time applications of C Proramming	CO2 – CO6	PO1, PO2, PO3, PO12, PSO1, PSO2

Text Books

1. Behrouz A. Forouzan., Richard F. Gilberg, "A Structured Programming Approach Using C", 3rd Edition, Cengage, 2007
2. Dromey R. G., "How To Solve It By Computer", 1st Edition, Pearson Education, 2014
3. Byron Gottfried, "Programming with C", 3rd Edition, Tata McGraw Hill, 2017
4. Herbert Schildt, "C The Complete Reference", 4th Edition, TMH, 2017
5. Ajay Mittal, "Programming In C A-Practial Approach", 1st Edition, Pearson, 2010

Reference Books

1. Balagurusamy E., "Computing fundamentals and C Programming", 2nd Edition, McGraw-Hill Education, 2017
2. Rema Theraja, "Programming in C", 2nd Edition,OUP India, 2016
3. Prasad F. E. V, "C Programming: A Problem-Solving Approach", Gilberg, Cengage Learning, 2010
4. Yashavant Kanetkar, "Let Us C", 16th Edition, BPB, 2017

Web References

1. https://www.geeksforgeeks.org/c-programming-language
2. https://www.tutorialspoint.com/cprogramming/index.html
3. https://www.javatpoint.com/c-programming-language-tutorial

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	30	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What do you mean by flowchart?
2. What are the components in the flowchart?
3. What are various storage classes in C?
4. What is a string?
5. Write a C program to copy one string to another
6. Write a C program to read and display the content of a file
7. What is recursive function?
8. What are the constraints for defining a recursive function with an example?
9. Why switch statement is more advantageous than nested if-else statement?
10. What is meant by a variable in C programming?
11. Write a C program to count number of vowels and consonants in a string using pointers

L2: Understand

1. Explain about enumerated types with example
2. Explain counter controlled and exit controlled loops with examples
3. Write a program to compare two strings for equality without using strcmp() function
4. Demonstrate about declaration and initialization of string in C. How strings are displayed with different formats? Explain with examples
5. Illustrate a C program to find the sum of first and last digit of a number
6. Illustrate a C program to merge two files into single file
7. Explain different looping statement with syntax and example
8. Explain function prototype and different methods to call the function
9. Explain in detail about array of structure and pointer to structure with example
10. Discuss the usage of bitwise logical operators used in C? Compare them from logical operators with suitable program
11. Explain about call by value and call by reference with reference to functions with example
12. Explain the term dynamic memory allocation and the terms malloc(), calloc() and realloc() functions

L3: Apply

1. Write a C program to check whether the given number is palindrome or not
2. Write a C program to solve the factorial of a given number using for loop
3. Write an algorithm, flowchart and pseudo code to identify largest of given 3 numbers using conditional operator
4. Write a C program to perform the operation of multiplication of two matrices
5. Write a C program to interchange the largest and smallest elements in an array
6. Write a C program by applying pointers to count number of vowels and consonants in a string
7. Write a C program to select any arithmetic operations using switch cases
8. Write a C program to find given number is Armstrong or not
9. Write a C program to check whether the given string is palindrome or not
10. List file handling functions. Utilize file handling functions with an example
11. Design a modular banking application using C programme that can facilitate transactions such as deposit and withdrawal of funds
12. How can you design an efficient algorithm to generate a list of the first n prime numbers? Can you analyse the time complexity of your algorithm? Implement and test your program to ensure it works correctly for a range of input values
13. Write a C program that finds the second largest element in an array of integers. Explain how you handle different cases such as empty array, array with only one element, array with duplicate elements, etc
14. Write a C program that simulates a simple calculator that can perform addition, subtraction, multiplication, and division operations on two operands. Explain how you handle user input, error checking, and precedence of operators
15. Write a C program that reads a text file and counts the number of words, lines, and characters in it. Explain how you handle different types of delimiters and end-of-file conditions

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Chairman
Board of Studies (CSE)

ES 23ESX03 Basics of Civil and Mechanical Engineering 3 0 0 3

At the end of the course, student will be able to

Code	Course Outcomes	Mapping with POs PO1	Mapping with POs PSO1	DoK
23ESX03.1	Comprehend the evolution of civil engineering, scope, functions and various building elements and materials	3	2	L1, L2
23ESX03.2	Demonstrate the principles of surveying	3	2	L1, L2
23ESX03.3	Calculate the required quantity of water and the purification process involved, solid waste management along with the sewage systems	3	2	L1, L2
23ESX03.4	Outline the role of mechanical engineering in the society and study of various metals and materials	3	2	L1, L2
23ESX03.5	Demonstrate the different manufacturing process, working principles of thermal systems	3	2	L1, L2
23ESX03.6	Illustrate the working principles of various power plants, Power transmission systems and fundamentals of robotics	3	2	L1, L2

All the COs are mapped to PO12 as few self-learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction to Civil Engineering **9 Hours**

History and development of civil engineering – scope for the civil engineering – Functions of civil engineering. Characteristics of good building materials like stone, brick, tile, timber, cement aggregate and concrete. General concepts relating to Buildings: Selection of site – Basic functions of buildings – Major components of buildings. Foundations - Purpose of a foundation – Bearing capacity of soils – types of foundations and their uses.

COs: CO1

Self - Learning Topic: Representation of the building plan

Unit II: Surveying **9 Hours**

Surveying: Definition and purpose – classification – Basic principles – Measurement of length by chains and tapes – Calculation of area of a plot – Introduction to Bearings, basic problems of Bearing - Levelling instruments used for levelling, calculation of the instrument height. Types of Highways, Types of pavements, Cross-section of the pavements, Camber

COs: CO2

Self - Learning Topics: Rise & fall method, Materials used for the various pavements

Unit III: Water supply & Sanitary Engineering **9 Hours**

Sources of water supply – Quantity of water requirements – Purification of water involving sedimentation, filtration and disinfection. Definition of terms – Collection and disposal of solid wastes – Sewage systems – Septic tanks – Oxidation ponds.

COs: CO3

Self - Learning Topics: Methods of water distribution, types of filters

Unit IV: Introduction to Mechanical Engineering **9 Hours**

Role of mechanical engineering in industries and society - Technologies in different sectors such as energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
Engineering Materials – Metals - Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

COs: CO4

Self - Learning Topic: Nanomaterials

Unit V: Manufacturing Processes & Thermal Engineering **9 Hours**

Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.
Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning

COs: CO5

cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

Self - Learning Topic: Surface finishing

Unit VI: Power plants, mechanical power transmission and Robotics **9 Hours**

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.
Introduction to Robotics – Joints & links, configurations, and applications of robotics. **COs: CO6**

Self - Learning Topic: Kinematics of robotics

Board of Studies	Civil Engineering & Mechanical Engineering	
Approved in: BoS No. VI	October 06, 2023	
Approved in: ACM No. VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 Importance of the safe bearing capacity of soils	CO1	PO1
2 Real time applications of mechanical systems	CO4 - CO6	PO1

Text Books

1. Shanmugam G. and Palanisamy M. S., "Basic Civil and the Mechanical Engineering", 4th Edition, Tata McGraw Hill Publications (India) Pvt. Ltd., 2013
2. Bhavikatti S. S.," Basic Civil Engineering", 3rd Edition, New Age International Publishers, 2022
3. Ganesan V., "Internal Combustion Engines", Tata McGraw Hill Publications (India) Pvt. Ltd., 2017
4. Rattan S. S., "A Tear book of Theory of Machines", Tata McGraw Hill Publications, (India) Pvt. Ltd., 2012

Reference Books

1. Punmai B. C.," Surveying Volume-1", 16th Edition, Laxmi Publications Pvt Ltd, 2006
2. Duggal S. N., "Environmental Engineering-1", 8th Edition, Tata McGraw Hill Publications (India) Pvt. Ltd., 2013
3. Appuu Kuttan K. K, "Robotics" Volume-I, 1st Edition, I. K. International Publishing House Pvt. Ltd., 2013
4. Jyothish Kumar L, Pulak M Pandey, "3D printing & Additive Manufacturing Technology", 2nd Edition, Springer Publications, 2018
5. Mahesh M Rathore, "Thermal Engineering", 5th Edition, Tata McGraw Hill Publications (India) Pvt. Ltd., 2010
6. Rao P. N, "Manufacturing Technology" – Vol. 1, 4th Edition, Tata McGraw Hill publications (India) Pvt. Ltd., 2017
7. Rao P. N, "Manufacturing Technology" – Vol. 2, 4th Edition, Tata McGraw Hill publications (India) Pvt. Ltd., 2018

Web References

1. https://www.youtube.com/watch?v=f2uuyKh02n4
2. https://www.youtube.com/watch?v=jdVgwbXZef8
3. https://nptel.ac.in/courses/112/103/112103019/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	60	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What are the properties of good stone?
2. What are the basic principles of surveying?
3. What are the sources of water supply?
4. What are ferrous metals?
5. List any two joining process
6. Define Robot
7. What is meant by pulverization?

L2: Understand

1. Identify the requirements in the selection of site for a construction
2. Illustrate the way to find the levels at various points of the plain area which is irregular in shape
3. Demonstrate the procedure which you want to follow in collecting and disposing the waste in your own community
4. How to calculate the area for the given plot by the use of conventional practice?
5. How to calculate the quantity of water requires for the given area?
6. Explain the role of mechanical engineer in manufacturing industry
7. Classify various engineering materials
8. Compare two stroke and four stroke IC engines
9. Explain the working principle of Hydro - electric power plant
10. Differentiate between two stroke and four stroke engines
11. Explain the working of overfeed and underfeed fuel beds
12. Explain the auxiliaries of a diesel power plant with neat sketch

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Chairmans
Board of Studies (CE & ME)

BS 23BSX32 Engineering Physics Lab

0 0 2 1

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO4
23BSX32.1	Relate the principle of physics in engineering field and compare the results with theoretical calculations	3	3
23BSX32.2	Demonstrate modern engineering physics techniques and tools in real time applications in engineering studies	3	3
23BSX32.3	Develop the laboratory skills in handling of electrical and optical instruments	3	3
23BSX32.4	Demonstrate the interference and diffraction phenomena of light	3	3
23BSX32.5	Analyse the effect of sound on physical parameters	3	3

List of Experiments

1.	Determination of Radius of Curvature of Plano Convex Lens by Newton's rings	**COs: CO1-CO4**
2.	Determination of wavelength of a source using Diffraction Grating Normal incidence method	**COs: CO1-CO4**
3.	Determination of thickness of thin Object- Air wedge method	**COs: CO1-CO4**
4.	Determination of wavelength of Laser source	**COs: CO1-CO4**
5.	Verify the relation between frequency and volume- Using Volume resonator	**COs: CO1,CO5**
6.	Determination of Rigidity modulus of material (wire)- (torsional pendulum)	**COs: CO1,CO2**
7.	Verify magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus	**COs: CO1-CO3**
8.	Determination of dispersive power of prism	**COs: CO1-CO3**
9.	Determine acceleration due to gravity and radius of gyration using compound pendulum	**COs: CO1,CO2**
10.	To find the Energy Band gap of a Semiconductor using p - n junction	**COs: CO1-CO3**
11.	Study the characteristics of a Thermistor and obtain its temperature coefficient	**COs: CO1-CO3**
12.	Determination of dielectric constant using charging discharging method	**COs: CO1-CO3**
13.	Determination of resolving power of a grating	**COs: CO1-CO4**
14.	Verification of laws of stretched string by using Sonometer	**COs: CO1,CO5**
15.	Estimation of Planck's constant using photo electric effect	**COs: CO1-CO4**
16.	Study the variation of B versus H by magnetizing the magnetic material (B-H curve)	**COs: CO1-CO4**
17.	Verification of Brewster's law	**COs: CO1,CO2, CO4**
18.	Determination of frequency of electrically maintained tuning fork by Melde's experiment	**COs: CO1-CO3**

Note: In the above experiments at least 10 assessment experiments should be completed in a semester, out of which 2 experiments may be conducted in virtual mode

References

1. Balasubramanian S., Srinivasan M. N. ,"A Text Book of Practical Physics"- S. Chand Publishers, 2017
2. Lab Manual for Engineering Physics, Department of Basic Science and Humanities, NSRIT, 2023

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Board of Studies (BS & H)

ES 23ESX06 Engineering Workshop 0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1
23ESX06.1	Demonstrate the workshop tools and their operational capabilities	1
23ESX06.2	Employ workshop tools for various joints and fitting.	1
23ESX06.3	Interpret the development of sheet metal using tin smithy tools	1
23ESX06.4	Illustrate the house wiring	1
23ESX06.5	Make use of moulding tools prepare a pattern	1

List of Experiments

Student shall **do two experiments** from five trades

Demonstration: Safety practices and precautions to be observed in workshop.

1	Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints. a) Half –Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint	COs:CO1, CO2
2	Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing	COs:CO1, CO2
3	Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises. a) V-fit b) Dove tail fit c) Semi-circular fit d) Bicycle tyre puncture and change of two-wheeler tyre	COs:CO1, CO2
4	Electrical Wiring: Familiarity with different types of basic electrical circuits and make the following connections. a) Parallel and series b) Two-way switch c) Go-down lighting d) Tube light e) Three phase motor f) Soldering of wires	COs:CO1, CO3
5	Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.	COs:CO1, CO4

Add-on Experiments

1	Welding Shop: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint	COs: CO1
2	Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters	COs: CO1

References

1. Lab Manual for Engineering Workshop, Department of Mechanical Engineering, NSRIT

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Board of Studies (ME)

ES 23ESX07 Engineering Graphics 1 0 3 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO10	PSO1	DoK
23ESX07.1	Demonstrate the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	3	3	2	L1 - L3
23ESX07.2	Construct the orthographic projections of points and lines in front and top views.	3	3	2	L1 - L3
23ESX07.3	Construct the systems of projection of planes and solids with respect to the observer, object and the reference planes	3	3	2	L1 - L3
23ESX07.4	Develop the concepts of sectional views to represent details of solids in simple positions.	3	3	2	L1 - L3
23ESX07.5	Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.	3	3	2	L1 - L3

All the COs are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction of Geometrical Constructions **9 Hours**

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

COs: CO1

Self - Learning Topic: Construct polygons by special methods

Unit II: Introduction of Orthographic Projections **9 Hours**

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

COs: CO2

Self - Learning Topic: Traces of lines

Unit III: Projections of Planes and Solids **9 Hours**

Projections of planes: Regular planes perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes

Projections of solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of solids with axis inclined to one reference plane and parallel to other

COs: CO3

Self - Learning Topic: Auxiliary views of planes

Unit IV: Projection and Section of solids **9 Hours**

Projections of Solids Projection of Solids with axis inclined to one reference plane and parallel to other Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only. **COs: CO4, CO5**

Self - Learning Topic: Development of surfaces

Unit V: Conversion of Views **9 Hours**

Conversion of Views: Conversion of isometric views to orthographic views and vice versa.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination). **COs: CO5**

Self - Learning Topic: Isometric Projection

Board of Studies		Mechanical Engineering	
Approved in: BoS No. VI		October 07, 2023	
Approved in: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Real time applications of engineering graphics	CO4 - CO5	PO1, PO10
2	Spatial Visualization	CO4 - CO5	PSO1

Text Books

1. Bhatt N.D.," Engineering Drawing", 53rd Edition, Charlot Publications, 2018
2. Agarwal and Agarwal," Engineering Drawing", 3rd Edition, Tata McGraw Hill Publishers, 2017
3. Sham Tickoo," Auto CAD 2017", Engineers & Designers", 23rd Edition, Dream tech Press, 2016

Reference Books

1. Narayana K. L. and Kannaiah P.," Engineering Drawing", 5th Edition, Scitech Publishers, 2017
2. Varghese P.I," Engineering Graphics", Mc Graw Hill Publishers, 2013
3. Venugopal K. Prabhu Raja V.," Engineering Drawing + Auto Cad", 5th Edition, New Age Publications, 2011

Web References

1. https://nptel.ac.in/courses/112/103/112103019/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	10
L2	40	30
L3	40	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

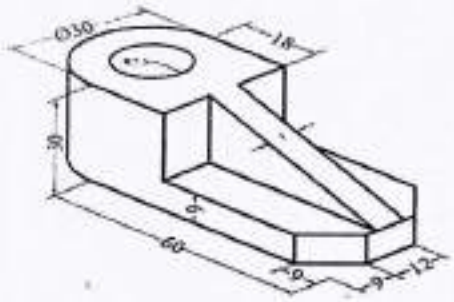
1. Divide a straight-line AB of 60 mm long into eight numbers of equal parts
2. How to draw an Octagon given the length of side 25 mm
3. Draw an equilateral triangle of 75 mm side and inscribe a circle in it
4. Show a regular pentagon in a circle of 100 mm diameter

L2: Understand

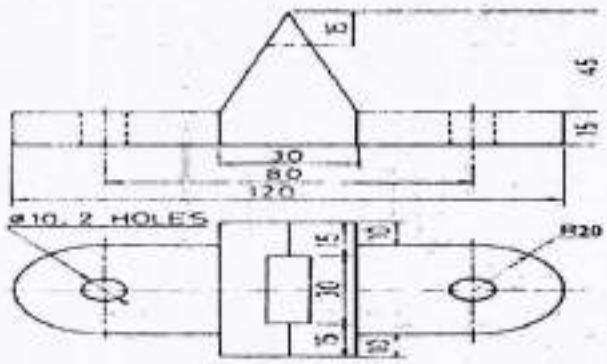
1. Cconstruct a cycloid for a generating circle of radius 30 mm. Also draw a tangent and normal at any point on the cycloid
2. A line AB is on HP and its one end A is 20 mm in front of VP. The line makes an angle of 45° with VP and its front view is 60 mm long. Draw the projections of the line and determine the true length
3. A regular hexagon of 40 mm side has a corner in the HP. Its surface inclined at 45° to the HP. And the top view of the diagonal through the corner which is in the HP. makes an angle of 60° with the VP. Demonstrate its projections
4. A pentagonal pyramid has an edge of the base in the VP and inclined at 30° to the HP, while triangular face containing that edge makes an angle of 45° with the VP. Illustrate the three views of the pyramid. Length of side of the base is 30 mm, while that of the axis is 65 mm

L3: Apply

1. A thin circular plate of 45mm diameter with its centre 35 mm above HP and 40 mm in front of VP is perpendicular to VP and inclined to HP at angle of 30°. Develop the projections of the plate
2. A square pyramid of base 40 mm and height 60 mm is on HP with one of its base edges so that the axis is making 45° with HP and the base edge making 30° with VP. Construct the projections
3. Construct a scale of 1.5 inches = 1 foot to show inches and long enough to measure up to 4 feet
4. Draw (i) Front View (ii) Top View (iii) Left Hand Side View



5. Build the Isometric view



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Head of the Department
Dept. of Electronics & Communication Engg.
N.S. Raju Institute of Technology
Sontyam - 531173

Chairman
Board of Studies (ME)

ES 23ESX05 Computer Programming Lab

0	0	3	1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs / PSOs						
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
23ESX05.1	Demonstrate the use of basic language features	2	2	2	1	3	2	1
23ESX05.2	Apply the right control structure for solving the problem	3	3	3	3	3	3	2
23ESX05.3	Implement simple programs to solve computing problems using user defined functions	3	3	3	3	3	3	2
23ESX05.4	Develop programs using arrays and pointers	3	3	3	3	3	3	2
23ESX05.5	Experiment with user defined data types and file operations	3	3	3	3	3	3	2

List of Experiments

1. Write C programs to familiarization with programming environment — **COs: CO1**
2. Write simple C programs with printf(), scanf() functions — **COs: CO1**
3. Write C programs to simple computational problems using arithmetic expressions — **COs: CO1**
4. Write C programs to computational problems using the operator' precedence and associativity — **COs: CO1**
5. Write C programs involving if-then-else structures — **COs: CO2**
6. Write C programs on while and for loops — **COs: CO2**
7. Write C programs on 1D array manipulation, linear search — **COs: CO4**
8. Write C programs on matrix, string operations — **COs: CO4**
9. Write C programs on functions, call by value, scope and extent — **COs: CO3**
10. Write C programs to implement recursive functions — **COs: CO3**
11. Write C programs on simple functions using call by reference, dangling pointers — **COs: CO4**
12. Write C programs on pointers, structures and dynamic memory allocation — **COs: CO4**
13. Write C programs on bitfields, self-referential structures — **COs: CO4**
14. Write C programs to implement file operations — **COs: CO5**
15. Domain Specific Applications
    - (i) Write a program to implement employee management system — **COs: CO5**
    - (ii) Write a program to implement election system — **COs: CO4**
    - (iii) Calculate the Eluer's load for a column with various end conditions — **COs: CO2**
    - (iv) Calculate the Shear force and Bending Moments for a beam under the various loading condition — **COs: CO2**
    - (v) Write a C program for resolution of forces — **COs: CO3**
    - (vi) Write a C program for calculation of coefficient of discharge — **COs: CO2**
    - (vii) Write a C program to find the efficiency of the DC motor for different values of time T — **COs: CO2**
    - (viii) Write a C program to derive the transfer function of a DC motor for given values — **COs: CO2**

Exercise problems

1. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
2. Exposure to Turbo C, gcc
3. Writing simple programs using printf(), scanf()
4. Write a C program to find sum and average of 3 numbers

5. Conversion of Fahrenheit to Celsius and vice versa
6. Simple interest calculation
7. Finding the square root of a given number
8. Finding compound interest
9. Area of a triangle using heron's formulae
10. Distance travelled by an object
11. Evaluate the following expressions
    a. A+B*C+(D*E)+F*G
    b. A/B*C-B+A*D/3
    c. A+++B---A
    d. J= (i++)+(++i)
12. Find the maximum of three numbers using conditional operator
13. Take marks of 5 subjects in integers, and find the total, average in float
14. Write a C program to find the max and min of four numbers using if-else
15. Write a C program to generate electricity bill
16. Find the roots of the quadratic equation
17. Write a C program to simulate a calculator using switch case
18. Write a C program to find the given year is a leap year or not
19. Find the factorial of given number using any loop
20. Find the given number is a prime or not
21. Compute sine and cos series
22. Checking a number palindrome
23. Construct a pyramid of numbers
24. Find the min and max of a 1-D integer array
25. Perform linear search on 1D array
26. The reverse of a 1D integer array
27. Find 2's complement of the given binary number
28. Eliminate duplicate elements in an array
29. Addition of two matrices
30. Multiplication two matrices
31. Write a C program to concatenate two strings without built-in functions
32. Write a C program to find reverse a string using built-in and without built-in string functions
33. Write a C function to calculate NCR value
34. Write a C function to find the length of a string
35. Write a C function to transpose of a matrix
36. Write a C function to demonstrate numerical integration of differential equations using Euler's method
37. Write a recursive function to generate Fibonacci series
38. Write a recursive function to find the lcm of two numbers
39. Write a recursive function to find the factorial of a number
40. Write a C program to swap two numbers using call by reference
41. Demonstrate Dangling pointer problem using a C program
42. Write a C program to copy one string into another using pointer
43. Write a C program to find no of lowercase, uppercase, digits and other characters using pointers
44. Write a C program to find the sum of a 1D array using malloc()
45. Write a C program to find the total, average of n students using structures
46. Enter n students data using calloc() and display failed students list
47. Write a C program to implement realloc()
48. Read student name and marks from the command line and display the student details along with the total marks
49. Create and display a singly linked list using self-referential structure
50. Demonstrate the differences between structures and unions using a C program
51. Write a C program to shift/rotate using bitfields
52. Write a C program to copy one structure variable to another structure of the same type
53. Write a C program to write and read text into a file
54. Write a C program to write and read text into a binary file using fread() and fwrite()
55. Write a C program to copy the contents of one file to another file

56. Write a C program to merge two files into the third file using command-line arguments
57. Write a C program to find no. of lines, words and characters in a file
58. Write a C program to print last n characters of a given file

References

1. Ajay Mittal, "Programming in C – A Practical Approach", 1st Edition, Pearson, 2010
2. Behrouz A. Forouzan, Richard F. Gilberg, "A Structured Programming Approach Using C", 3rd Edition, Cengage, 2007
3. Forouzan, Gilberg, Prasad, "C Programming: A Problem - Solving Approach", 1st Edition, Cengage Learning, 2011
4. Lab Manual for Computer Programming, Department of Computer Science & Engineering, NSRIT

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Chairman
Board of Studies (CSE)

Dept. of Electronics & Communicatin Engg.,
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam - 531173

Wellness **23WLP01 Health And Wellness, Yoga and Sports** **0 0 1 0.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO7	PO12
23WLP01.1	Be physical fit to perform daily routine without undue fatigue	1	1
23WLP01.2	Be mentally alert and socially cohesive	1	1
23WLP01.3	Consider success and failure equally	2	1
23WLP01.4	Develop positive personality	1	1
23WLP01.5	Improve leadership qualities	2	1

Unit I: Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups. **3 Hours**

Activities

i) Organizing health awareness programmes in community
ii) Preparation of health profile **COs: CO1**
iii) Preparation of chart for balance diet for all age groups

Unit II: Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation,stress management and yoga, Mental health and yoga practice. **3 Hours**

Activities

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar **COs: CO2**

Unit III: Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games. **3 Hours**

Activities

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.Practicing general and specific warm up, aerobics **COs: CO3**
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running

General Guidelines

1. Institutes must assign slots in the timetable for the activities of Health/Sports/Yoga
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students

Assessment Pattern

1. Evaluated for a total of 100 marks
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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Board of Studies (B S & H)

SOC 23SOC18 Plumbing **0 0 0 2**

At the end of the course, students will be able to

Code	Course Outcomes
23SOC18.1	Demonstrate the principles of designing plumbing systems for different types of fluids, including gas, air, steam, sewage and water
23SOC18.2	Demonstrate competency in the use of specialized tools and equipment essential for professional pipe installation
23SOC18.3	Diagnose and troubleshoot common plumbing problems in residential, commercial and industrial settings

Min. 60 Hours

Plumbing tools, levelling instruments, valves and meters, soft soldering, rigging and hoisting, Pipe Materials & Joining Methods, Plumbing Fixture, Distribution Piping, Drain, Waste & Vent System, Water Heating / Fuel Storage Equipment, Site & Drain Design, installing water supply piping, septic systems, storm ater and sumps, reapiring water supply systems, supporting and testing pipe.

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SOC 23SOC17 Refirgeration and Air Conditioning **0 0 0 2**

At the end of the course, students will be able to

Code	Course Outcomes
23SOC17.1	Develop the knowledge and practical skills required to install, troubleshoot, and repair a wide range of R&AC systems, including heating, ventilation, air conditioning, furnaces, and water heaters
23SOC17.2	Demonstrate the procedures for conducting warranty services, including documenting issues, ordering replacement parts, and completing repairs within warranty coverage
23SOC17.3	Learn to assess and identify maintenance issues in refrigeration and air condition equipment, as well as recommend preventive measures to improve system longevity and performance

Min. 60 Hours

Refrigeration and Air Conditioning: Types of refrigerants, study of refirgeartion cycles, Vapour absorption system, Vapour compression refrigeration test rig, study of compressors, valves, types of air conditioning, Summer and winter air conditioning, Fitting and Welding,Thermal Insulation,Commercial RAC Plants & Car Air Conditioner,Commercial Compressor & Capacity Control,Water Softening Plants & Chiller, three fulid refrigeration

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SOC 23SOC09 Mobile TroubleShooting

0 0 0 2

At the end of the course, students will be able to

Code	Course Outcomes
23SOC09.1	Demonstrate the Basic electronics concepts and Basics of mobile communications and different mobile technologies.
23SOC09.2	Gain proficiency in various components of PCB and different Sections on Motherboard and Different ICs used in MotherBoard.
23SOC09.3	Gain proficiency in Hardware and Software tools and troubleShootings.

Min. 60 Hours

Basic Electronics - Current, Voltage, AC Current & DC Current, Resistor, Transistor, Capacitor, Diode, Inductor / Coil, Transformer, Integrated Circuit , Study of Digital Electronics, Study of Various components inside the mobile phone, Assembling and disassembling of various models of mobile phones,Study of various tools and equipment used in mobile phone repairs, Using a multi-meter, Use of DC Power Supply, Introduction and study of Printed Circuit Board (Motherboard), Details of various components on the PCB, Circuits and Different Sections on Motherboard: Power Circuit, Charging Circuit, SIM Circuit, Display Circuit, Keypad Circuit, Touch Screen Circuit, Audio Circuit, Memory card Circuit, Speaker and Microphone Circuit, Network Circuit, Bluetooth Circuit, Wi-fi Circuit, Testing of various parts and components, Study of different ICs (chips) used on the motherboard, How to recognize various ICs, Soldering & de-soldering of components by using a soldering iron, Soldering & de-soldering of components by using a rework station, Reheating and mounting of various BGA and SMD chips. Use of various secret codes. Fault finding, troubleshooting and repairing of various faults, Common repair procedure for hardware related faults, Common repair procedure for software related faults, Water damaged repair techniques, Circuit tracing, jumper techniques and solutions, Troubleshooting through schematic diagrams, Advanced troubleshooting techniques.

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SOC 23SOC21 Computer Servicing **0 0 0 2**

At the end of the course, students will be able to

Code	Course Outcomes
23SOC21.1	Demonstrate system Assembling and hardware troubleshooting
23SOC21.2	Identify automated backups of your system
23SOC21.3	Build systems to safeguard from various types of user activities
23SOC21.4	Solve and configure Networking related issues

Min. 60 Hours

Identify motherboard components and connections, understand error code for fault troubleshooting, verify components with the configuration of CMOS BIOS set up, Test and understand various beep sounds in case of trouble, Assemble and disassembling a Computer System, Upgrade RAM, HDD and other parts. Test fault finding and troubleshooting techniques, Configuration of camera, mic, WLAN and Bluetooth etc, install any popular antivirus software – View its various options, Explore Firewall options, use various disk cleanup utilities to remove junk files from hard disk, create automated backups, identify various Network devices – Switch, Router, Rack, crimping LAN cables, installing a printer and carrying self-test, Replacement of toner cartridge of laser printers.

SOC 23SOC11 Digital Marketing

0 0 0 2

At the end of the course, students will be able to

Code	Course Outcomes
23SOC11.1	Identify the Market and the behaviour of the customer and how the digital marketing will be useful
23SOC11.2	Search engines, methods to identify the search engines and their optimization in both on page and off page
23SOC11.3	Exercise on the Social media marketing and Email Marketing and gaining the reputation through online management
23SOC11.4	Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets

Min. 60 Hours

Introduction to Digital Marketing: Nature and Scope of Digital Marketing, Evolution of Digital Marketing, Traditional versus digital marketing, Integration of Market Place from conventional to the virtual, Social Media and Communication Mix – Benefits & Challenges – social media and Customer Engagement – ROC – New Role of Customers – The Social Business Eco system – REAN, RACE, integrating social media with Overall Market efforts – Developing Social Media Marketing plan. Social Media Business Blocks: Segmenting B2C Market – B2B Markets – managing the cyber social Campaign – Joining the Conversation – Lurking and Listening – Engagement with Audience – Staying Engaged – Engagement on the Social Web – Social Objects – Social graph – Social Applications – leveraging Search Engine Optimization (SEO) for social media – Optimizing social media for Search Engines. Digital Media Mix: Blogs, Podcasts, Vlogs – Blog – Create a Podcast – Producing the Video cast – Measuring Blogging, Podcasting, Vlogging Metrics using any social media like Facebook, Twitter, LinkedIn etc. Measuring the Results – Other Social Media Marketing Sites – Communities.

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Board of Studies (CSE)

SOC 23SOC13 Electrical Winding

0 0 0 2

At the end of the course, students will be able to

Code	Course Outcomes
23SOC13.1	Examine various tools and know their usage
23SOC13.2	Explain different joints, soldering practice andexecute wiring circuits
23SOC13.3	Perform various methods of earthing

Min. 60 Hours

Identify size, shape, purpose, speed and use of electrical wiring tools with respect to screw drivers, polers, drilling machines, Rawl plug jumpers, Line tester, Splicers, Standard wire gauge, Identify different types of electrical wiring accessories with respect to switches, Ceiling roses, Lamp holders and adopters, Sockets, Plug, Fuses, Identify different types of main switches with respect to SP, DP mains, TP, ICDP, ICTP, SPDT, DPDT, TPDT, Change over-Knife type, Rotary, Micro, Modular switches, 2-pole and 3-pole MCBs. Prepare straight joint/Married joint, T joint, Western union joint, Pig tail joint, Femialirisation to use soldering tools and components and soldering of simple electronic circuits on PCB. Make a circuit with one lamp controlled by one switch with PVC surface conduit system, two lamps controlled by two switches with PVC surface conduit system, Make a circuit with one lamp controlled by one switch and provision of 2/3-pin socket. Make a circuit for stair case wiring, Make a circuit for godown wiring, Control two lamps by series - Parallel connection using one 1-way switch & two 2-way switches with PVC surface conduit system, Controlt wosub – circuits through energy meter, MCB's and two1-way switches, Prepare switch board with star delta starter, MCB, Pilot lamps for 3 phase motor, Control and practice the wiring for fluorescent lamp, Connect computer by main switch board with a miniature circuit breaker. Prepare pipe earthing and plate earthing.

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Board of Studies (EEE)

SOC 23SOC14 Masonry 0 0 0 2

At the end of the course, students will be able to

Code	Course Outcomes
23SOC19.1	Identify the tools required for various purposes and its working in construction activity
23SOC19.2	Preparing the cement sand motor mix in appropriate proportions based on the suitability and type of work
23SOC19.3	Undergo the types of openings, floors and need for the slope and ceiling finish as per the drawings and standards

Min. 60 Hours

Introduction to the tools and their usage, materials, properties, ratios of the mix, types masonry, types of bonds in masonry, height and width of rooms based on the purpose, types of partition, materials for partition, openings, requirements of openings, height and width of openings and ventilators, types of materials used as ventilators, provision of grooves in the brick work, finishing materials, thickness of finish, motor ratio for the finishings, types of shuttering, checking of the level by the Plum bob or liquid levels. Performing the RCC works by rod cutting, bending & placing. Making of the different floors with various materials with determination and formation of slopes, performing the ceilings finishing for the slabs must be done as per the standards and with drawing specifications maintaining the accuracy.

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Board of Studies (CE)

SOC **23SOC20 Automobile Servicing and Maintenance** **0 0 0 2**

At the end of the course, students will be able to

Code	Course Outcomes
23SOC20.1	Identify parts in a diesel and petrol engine of LMV/ HMV
23SOC20.2	Observe and report the reading of Tachometer, Odometer, temp. and Fuel gauge under ideal and on load condition
23SOC20.3	Engage in practical exercises to discern variances in the constituents of gasoline and diesel engines, and acquire hands-on experience in disassembling both light and heavy motor vehicle engines following established protocols

Min. 60 Hours

Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2 & 4 - stroke diesel engine (Compression ignition Engine (C.I)), Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification. Study of various gauges/instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such a gearshift position, Seat belt warning light, Parking-brake-engagement warning light and an Engine- malfunction light.

Different type of starting and stopping method of Diesel Engine Procedure for dismantling of diesel engine from a vehicle.

Petrol Engine Basics: 4-stroke spark-ignition engines- Basic 4-stroke principles. Spark-ignition engine components - Basic engine components, Engine cams & camshaft, Engine power transfer, Scavenging, Counter weights, Piston components. Intake & exhaust systems – Electronic fuel injection systems, Exhaust systems. Intake system components, Air cleaners, Carburettor air cleaners, EFI air cleaners, Intake manifolds, Intake air heating.

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